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United States General Accounting Office

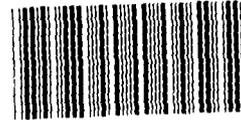
GAO

Briefing Report to Congressional Requesters

April 1988

# NUCLEAR POWER SAFETY

## International Measures in Response to Chernobyl Accident



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studies and reviews, and regulation and standard-setting have been performed in the half dozen advanced member states that supply nuclear power technology to all the others, rather than by IAEA.

IAEA has been active in transferring nuclear safety technology worldwide by publishing nuclear safety standards and conducting safety conferences. After the Chernobyl accident, IAEA expert groups recommended that the nuclear safety standards be reviewed to ensure that the lessons learned from Chernobyl in such areas as fire prevention and fire fighting are incorporated in the standards. An expert group also recommended that the Agency's incident reporting system be upgraded and reports extensively analyzed so that any lessons learned are available to member states.

Member states have also encouraged IAEA to increase the number of its Operational Safety Review Team visits to countries with nuclear power programs, and some additional funding has been made available for that purpose. The visits are made at the invitation of a member government for the purpose of obtaining an objective assessment of a power plant's operational safety practices against other successful international practices and to exchange ideas on improving safety at the working level. The results of IAEA inspections are submitted to the government for its exclusive use.

## Mandatory Standards and Inspections

IAEA members have placed greater emphasis on accident prevention to help widen safety margins. There is disagreement on the kinds of preventive measures, such as mandatory nuclear safety standards and a verification by inspection regime, which would offer assurance that nuclear power plants worldwide are operated safely. Many IAEA member states, including the United States, believe that a mandatory standards and verification regime would infringe on national sovereignty and would be expensive, impractical, and of questionable benefit. The United States has resisted having such a regime included in an international agreement to avoid the "tendency towards settling upon the lowest common denominator." On the other hand, the Director General of IAEA believes it may be feasible to transform some nuclear safety standards "into general binding minimum rules or principles." However, no specific proposals have been made.

We provided the Department of State with a draft of this report for its review and comment. State consulted with the Departments of Defense and Energy and the Nuclear Regulatory Commission in reviewing the

guidelines on assistance and notification in 1984 and 1985, respectively; most members saw the necessity of making them binding on members that sign the agreements. Some of the impetus for the agreements was due to the failure of the Soviet Union to promptly notify the IAEA or its members of the Chernobyl accident. The agreements do not concern operational safety or the prevention of nuclear accidents.

Both agreements assign an important role to the IAEA in facilitating cooperation among members in the event of a nuclear power accident. IAEA plans to take a number of supporting actions to implement certain provisions of the agreements. These include the development of an (1) emergency response capability for managing information from nuclear accidents and (2) emergency assistance manual, listing experts, equipment, and materials available in member states. The State Department believes that development of the manual will be a limited activity because most of the information needed will be kept by national authorities.

Some countries have expressed reservations that the Convention on Early Notification of a Nuclear Accident does not sufficiently obligate countries to report nuclear accidents promptly. They are concerned that the requirement for reporting a radiological release would allow the same type of delay in notification as occurred during the Chernobyl accident.

The Convention on Early Notification is also broad concerning the kinds of nuclear accidents to be reported. In drafting the agreement, most of the nuclear weapons states as well as some other member states did not want to be compelled to disclose sensitive military information on minor accidents involving nuclear weapons.

## IAEA's Nuclear Safety Activities

After the Chernobyl accident many in government, industry, and the public looked to IAEA to expand its nuclear safety role; however, it is limited to giving technical advice related to radiological safety and protection and facilitating cooperation in nuclear safety activities of member states. IAEA receives its mandate and funding from its member states and can undertake only activities approved by them. The IAEA currently operates on a stringent budget imposed by the member states. IAEA has no regulatory role, and responsibility for nuclear safety remains with each member nation. Most nuclear safety research and development,



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report and each agency suggested clarifications, which we have incorporated, where appropriate, in the final report.

Copies of this report are being sent to the Secretaries of State, Defense, and Energy and to the Chairman of the Nuclear Regulatory Commission, various congressional committees, and other interested individuals, and will be made available to others on request. If you have questions on the information provided, please contact me on (202) 275-4812.



Allan I. Mendelowitz  
Senior Associate Director



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## Abbreviations

IAEA	International Atomic Energy Agency
INSAG	International Safety Advisory Group
NUSS	Nuclear Safety Standards
OSART	Operational Safety Review Team
WHO	World Health Organization

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## The Role of IAEA After Chernobyl

The events at Chernobyl and the resultant transboundary radiation effects underscored the international character of a nuclear accident. The accident also underscored the role of the IAEA as the foremost international organization concerned with worldwide nuclear safety.<sup>1</sup> IAEA served as the primary channel for communicating information regarding the accident, and its overall role in nuclear energy provided a forum for considering what more needs to be done to improve nuclear safety worldwide.

The IAEA, an independent intergovernmental organization within the United Nations System, was created by its member states and it can undertake only those activities agreed to by them. Many members have taken the position that IAEA should undertake only those additional safety activities for which it has adequate resources to act effectively. Currently, IAEA operates on a stringent budget imposed by the member states. Some member states without nuclear power programs are wary that new programs will be undertaken at the expense of technical cooperation programs, and nuclear weapons states and some other member states are concerned that resources could be diverted from the safeguards inspection program.

However, following the Chernobyl accident there was tremendous sentiment among IAEA's member states to improve the safety of nuclear reactors worldwide. Some members proposed that additional activities be undertaken by IAEA immediately following the Chernobyl accident, even though assessment of the causes of the accident and "lessons learned" were far from complete.

In the weeks following the accident, many IAEA members agreed that the Soviet accident clearly demonstrated the need for a formal convention for timely accident reporting and monitoring. The accident also raised the prospect for international coordination of emergency assistance, particularly for health and safety, also through a convention. The need for these conventions was identified because of the Soviet Union's delay in reporting the Chernobyl accident to the rest of the world. The IAEA did not receive official notification until 2 days after the accident. By

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<sup>1</sup>Other international organizations that have programs for the advancement of nuclear safety issues are the (1) Nuclear Energy Agency of the Organization for Economic Cooperation and Development, (2) International Commission on Radiological Protection, (3) International Labor Organization, (4) U.N. Environmental Program, (5) U.N. Disaster Relief Organization, (6) International Organization for Standardization, and (7) World Health Organization.

# Background

On April 26, 1986, an accident at the fourth unit of the Chernobyl nuclear power plant in the Soviet Union destroyed the reactor core and part of the building in which it was housed, releasing large amounts of radioactive materials into the surrounding environment. The hot materials that were expelled started fires and lifted radioactive materials high into the air where it was carried away in the form of gases and dust particles by normal air currents. Most of the radioactivity remained in the Soviet Union, but significant amounts spread into countries in central and northern Europe.

The accident took place while a turbogenerator was being tested during a normal, scheduled shutdown of the reactor. The Soviets were testing the ability of the turbogenerator to supply electrical energy for a short period during station blackout until standby diesel generators could supply emergency power. Improper test procedures and violations of basic operating rules put the reactor at dangerously low power levels, and it could not be stabilized by manual control. Considering the particular design characteristics of the reactor, it was being operated unsafely. The operators violated operating procedures and withdrew most control and safety rods from the core and switched off some important safety systems.

The International Nuclear Safety Advisory Group, a body of 13 nuclear safety experts from member states of the International Atomic Energy Agency (IAEA) reported that subsequent events led to an increasingly rapid growth in power and an attempt was made to stop the chain reaction. But the possibility of a rapid shutdown of the reactor was limited, as most of the control rods had been withdrawn completely from the core. Energy suddenly released in the fuel by the power surge ruptured part of the fuel into minute pieces.

The energy release shifted the 1,000-ton reactor cover plate, cutting off all cooling channels on both sides of the reactor cover. After 2 or 3 seconds, a second explosion ejected hot pieces of the reactor from the destroyed reactor building. The destruction of the reactor permitted air to enter, causing the graphite core to burn and provide a lofting of additional radioactivity.

main areas: (1) Basic Safety Standards for Radiation Protection, aimed at protecting workers and the public from the risks of exposure to ionizing radiation, and (2) a wide-ranging Nuclear Safety Standards (NUSS) program to guide members in establishing internationally acceptable safety codes and guides for nuclear power programs. IAEA has also established an Incident Reporting System, Operational Safety Review Teams, and Radiation Protection Advisory Teams.

## Standards for Radiation Protection

As the number of operating plants increased in the 1980s, so did the importance of radiation protection for workers. In 1982, IAEA revised the Basic Safety Standards for Radiation Protection, which were established jointly by the IAEA, International Labor Organization, World Health Organization (WHO) and the Nuclear Energy Agency of the Organization for Economic Cooperation and Development. The revised standards are based on recommendations of the International Commission on Radiological Protection. The standards specify that all practices involving exposure to radiation must be justified in relation to their benefits or those of any available alternative and they set limits on permissible exposures in order to optimize protection. According to IAEA, efforts are made to encourage the application of the principles of dose limitation not only in situations where exposure can be controlled but also in abnormal situations, such as in planning and preparing for radiation emergencies.

## Standards for Nuclear Power Plants

In the 1970s, as the number of orders for new nuclear power plants increased, work began on a comprehensive body of nuclear safety standards for nuclear plants. By 1985, 60 NUSS documents (codes and guides) had been developed for the purpose of establishing internationally acceptable guidelines. These documents contain recommendations for nuclear power plant safety involving siting, design, operation, quality assurance, and governmental organization.

IAEA encourages members to integrate the NUSS documents into their national licensing programs and offers assistance through training programs, seminars, safety missions, and expert services. However, adoption of the guidelines by IAEA's member states has been limited. A 1983 IAEA survey of 62 member states with planned or operating nuclear power programs showed that only 9 of those responding, had officially endorsed the standards or used them as a regulatory requirement;<sup>3</sup> 19

<sup>3</sup>The nine are Argentina, Brazil, Czechoslovakia, Italy, Pakistan, Portugal, Switzerland, Thailand, and Turkey. Of these, Portugal, Thailand, and Turkey do not operate nuclear power plants.

that time, radiation had spread over much of Europe, and Western European governments reacted to the high radiation readings in their countries with confusion and anger over the delay in reporting the accident. Further, the European Parliament condemned as unacceptable the attitude of the Soviet authorities who refused to provide prompt and precise information about the accident to the countries concerned. This criticism was muted, however, when the Soviets indicated a willingness to cooperate and to make a full report of the accident at an August 1986 conference sponsored by the IAEA.

Additionally, there were concerns that little was known about the design, construction, and operation of the Soviet RBMK 1000 megawatt reactor involved in the accident and therefore that its safety aspects could not be assessed. The Soviets have 14 other plants similar to the one at Chernobyl which provide over 50 percent of their nuclear-generated electrical capacity. The fact that the reactor at Chernobyl had never been inspected by IAEA nuclear experts prompted some members to propose a mandatory international reactor safety verification regime involving regulation and inspection by an international organization such as the IAEA. IAEA's Expert Working Group proposed that some of IAEA's nuclear safety standards be transformed into minimum binding rules or guidelines to which member states might commit themselves.

## IAEA's Nuclear Safety Program

IAEA's role in nuclear safety is principally advisory, and adherence to its published standards and guidelines is voluntary. The IAEA is not designed to function as an operating extension of national regulatory authorities, although it is a facilitator of technical information flow and advice related to radiological safety and protection. Each member state is responsible for regulating its own nuclear activities. Although reactor types and national approaches differ, IAEA officials believe that most members have similar nuclear safety goals. IAEA's early work centered around establishing standards for issues that were clearly of an international character; for example, regulations for transporting radioactive materials across international boundaries were developed in the 1960s.

IAEA is authorized by its statute<sup>2</sup> to establish standards for protecting health and minimizing danger to life and property and to give assistance in the application of these standards. It has developed standards in two

<sup>2</sup>IAEA's statute is a general international agreement, or treaty, and was adopted unanimously on October 23, 1956, by the Conference on the Statute, in which 81 of the 87 invited countries participated.

perform an approximately 3-week, in-depth review of the local operating practices, such as maintenance, operations, technical support, radiation protection, training, and emergency planning.

The review is not aimed at checking compliance with national regulatory requirements but rather at objectively assessing the plant's operational safety practices against other successful international practices and at exchanging ideas on improving safety at the working level. Each review is tailored individually and can include an evaluation of up to eight operational safety areas. At the end of the evaluation, a confidential on-site report is prepared for use by operators and utility authorities. The report is advisory and nonbinding on all parties. From these OSART exercises, IAEA officials hope that an internationally agreed level of operational safety may be achieved, not through direct administrative actions but by some "spontaneous acceptance of successful, cost-effective safety practices." Through early April 1987, 15 OSART missions had been conducted by IAEA, as listed in table I.1.

Table I.1: OSART Missions Between 1983-87<sup>a</sup>

Year	Country	Reactor
1983	Republic of Korea	KO-RI, Unit-1
1984	Yugoslavia Philippines	Krsko PNPP
1985	Pakistan Philippines Brazil France	Kanupp PNPP Angra, Unit-1 Tricastin, Unit-1
1986	Mexico Finland Sweden Netherlands Federal Republic of Germany Republic of Korea	Laguna Verde, Unit-1 Olkiluoto, TVO, Unit-1 Barsebaeck, Unit-1 Borssele Biblis, Unit-A KO-RI, Unit-3
1987	Federal Republic of Germany Italy Mexico	Krummel Caorso Laguna Verde

<sup>a</sup>Through April 3, 1987.  
Source: IAEA

## Radiation Protection Advisory Teams

The Radiation Protection Advisory Team program was established in 1984 to assess needs and to design technical assistance strategies for furthering radiation protection standards. The program covers all activities involving the use of ionizing radiation in the nuclear fuel cycle and in industry, medicine, and agriculture. Eleven missions to developing

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countries indicated that they use the standards as a source of information for establishing national regulations or for training purposes, and 2 countries indicated that they do not use the standards.

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## Sharing Operational Experience

In the early 1980s, orders for new nuclear power plants began to decrease, due partly to the 1979 accident at Three Mile Island. This led IAEA to reconsider its program and to shift its focus from setting standards for design and construction safety to operational safety. Safety experts worldwide, therefore, began focusing on mechanisms to use the growing body of operational experience at nuclear power plants. After Three Mile Island, more countries recognized that feedback of operational experiences beyond national boundaries provided a unique opportunity to improve nuclear safety.

A number of countries have systems to collect, analyze, and report information on safety-related events and situations in nuclear power plants. Also, the Nuclear Energy Agency has a system of sharing operational experience among the Western European nations, Canada, Japan, and the United States. Then, in 1983, IAEA began operating an international Incident Reporting System to share operational safety experience among its members. The United States and some other countries expressed reservations about the need for another reporting system unless the new system would include incident data from IAEA member states not already participating in the Nuclear Energy Agency's Incident Reporting System. The United States did not begin to participate in the IAEA system until August 1985 and, even then, would participate only through the Nuclear Energy Agency. As of November 1986, 15 of the 26 members with operating nuclear power plants were participating in the Incident Reporting System, 7 others were participating through the Nuclear Energy Agency, and 4 were not participating. The system's incident reports<sup>4</sup> are not available to the public.

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## Operational Safety Review Teams

In 1982, IAEA created the Operational Safety Review Team (OSART) program "to provide useful advice to nuclear power plant managers on how to enhance the safety of their plants." The teams are composed of 10 to 15 experienced individuals, often managers from other nuclear power plants, who travel to a plant site at the request of a member state and

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<sup>4</sup>The reports contain information on safety-related/safety-significant events and situations at nuclear power plants, such as overexposure of workers or the public to radiation and failures of monitoring instruments.

# International Response Initiatives After Chernobyl

Shortly after the Chernobyl accident, political leaders from both the West and East urged the broadening of international cooperation in nuclear safety, including a system of prompt notification and supply of information in the event of nuclear emergencies within the framework of the IAEA.

## Agreements to Bind International Cooperation

In response to the call for international cooperation, the IAEA Board of Governors, in May 1986, identified the need to establish representative groups of government experts to draft, on an urgent basis, two international agreements committing its members to

1. provide early notification and information about a nuclear accident with possible transboundary effects, incorporating IAEA guidelines published in 1985—"Guidelines on Reportable Events, Integrated Planning and Information Exchange in a Transboundary Release of Radioactive Materials," and
2. coordinate emergency response and assistance in the event of a nuclear accident that could involve transboundary radiological release, incorporating IAEA guidelines published in 1984—"Guidelines for Mutual Emergency Assistance Arrangements in Connection with a Nuclear Accident or Radiological Emergency."

These agreements would concern international cooperation only after a nuclear accident and would not provide for increasing nuclear safety at power plants. Although a number of member states talked about the need for some kind of binding or mandatory international standards, the United States and other member states with nuclear power programs maintained that nuclear safety was a national responsibility and that such mandatory standards were not necessary. From July 21 to August 15, 1986, about 150 government experts from 56 member states and 9 international organizations met to draft the two agreements and to have them ready for approval at IAEA's General Conference in September 1986.

The Early Notification Convention entered into force on October 27, 1986. The Assistance Convention entered into force on February 26, 1987. Although the United States signed both conventions on September 26, 1986, the U.S. Senate has not yet ratified them. As of March 18, 1987, these conventions had been signed by 62 and 61 member states, respectively. This quick action following the Chernobyl accident sharply contrasts with the unsuccessful U.S. efforts during 1981-84 to convince

countries had been completed in 1986. According to IAEA, the assessments help non-nuclear-power member states to establish radiation protection capabilities. Assessments in some countries show that national authorities are ineffective in conducting such activities while other authorities have yet to establish such capabilities.

## Objective, Scope, and Methodology

On May 19, 1986, the Chairman of the Subcommittee on Energy, Nuclear Proliferation, and Government Processes, Senate Committee on Governmental Affairs, asked us to examine the potential for IAEA to expand its role in nuclear safety, including greater inspection and accident response roles. To address this objective, we examined the

- mechanisms established in the international conventions for mitigating the consequences of a nuclear power plant accident,
- feasibility of establishing mandatory safety standards,
- potential of the IAEA to conduct mandatory safety inspections, and
- potential for expanding IAEA's OSART program.

We also examined IAEA member responses to the Chernobyl accident and proposals made by them to improve international nuclear safety.

We reviewed pertinent records and talked with officials at the Departments of State and Energy and the Nuclear Regulatory Commission in Washington, D.C.; the IAEA in Vienna; the Nuclear Energy Agency of the Organization for Economic Cooperation and Development in Paris; and at the U.S. missions to these organizations.

We attended Atomic Industrial Forum conferences as well as Harvard University's Russian Research Center conference on the Chernobyl accident.

Our work was performed from May 1986 through April 1987 in accordance with generally accepted government auditing standards.

requires the notifying state to respond promptly to a request by an affected member state for additional information or consultations that would enable the latter to take measures for protecting the health and safety of its population and environment.

Under the Convention, IAEA would serve as the focal point for receiving notifications and disseminating the information received. Upon request from a member which has no nuclear activities and borders on a state which is not party to the Convention but which has an active nuclear power program, it would also assist in feasibility studies for establishing an appropriate monitoring system.

Establishing bilateral or multilateral arrangements among the members is permissible under the Convention as a means of strengthening mutual cooperation. In January 1987, Finland and the Soviet Union concluded an agreement on early notification and on information exchange regarding nuclear installations in which reference is made to the Notification Convention. According to the Director General of IAEA, such neighboring country agreements to supplement the Convention are desirable; however, member states have not reached any conclusions on what kind of role, if any, the IAEA might play in their development and implementation.

## Convention on Assistance

The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency sets out an international framework for facilitating the prompt provision of assistance directly among member states or through the IAEA or other international organizations. Member states would be required to notify the IAEA of experts, equipment, and materials they could make available to assist other states. The requesting state would be responsible for overall direction and control of the assistance undertaken within its territory and, to the extent of its capabilities, would provide local facilities and supporting services to administer the assistance. In most instances, it would also grant to the personnel provided by the assisting party the privileges and immunities necessary for carrying out the assistance. For example, they would be protected from criminal prosecution and civil liability, except in the case of willful misconduct.

Member states also agreed to help move personnel, equipment, and property involved in an emergency through their territories when requested. Assistance might be provided cost-free and, to this end, the special needs of developing countries and countries without nuclear

the international community of the need to negotiate a global multilateral convention for emergency response in the event of a nuclear accident. At that time, some other countries were not ready to commit themselves to such a convention and were content with the nonbinding guidelines published by IAEA in 1984. IAEA officials stated that these guidelines could be used to facilitate bilateral or regional agreements to provide assistance in the case of a nuclear accident. As of April 1987, no such agreements had been negotiated by or through the IAEA.

Many countries believed that a convention would intrude into areas within their national jurisdictions, such as a nuclear safety regulation. The massive Chernobyl accident changed that perception. The need for a binding international convention among member states was also buttressed by the Soviet Union's failure to follow IAEA's nonbinding guidelines for early notification and information about nuclear accidents with transboundary effects following the Chernobyl accident. According to an IAEA official, the Soviets did not actively participate in drafting either of the guidelines. The final guidelines were published in each of IAEA's five official languages, including Russian.

Under both conventions, according to an IAEA legal officer, any information provided in confidence would have to be protected by the state and international organizations receiving it.

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## **Early Notification Convention**

The Convention on Early Notification of a Nuclear Accident covers all uncontrolled releases of radioactive material from almost any source, regardless of its nature and location, that may result in transboundary effects which could be of radiological safety significance to another state. Thus, according to IAEA officials, any nuclear accident involving facilities or activities carried out anywhere under the jurisdiction of member states signing the Convention—on land, at sea, or in outer space—would be subject to its notification requirements. The Convention does not include accidents connected with nuclear weapons and nuclear weapons tests.

In the event of a nuclear reactor accident with actual or potential transboundary effects, a member state would be required to promptly notify the IAEA as well as those countries that could be physically affected by the accident about when and where it occurred. It would further be obliged to promptly provide them with information relevant to minimizing the radiological consequences. The information to be provided by the notifying state is specified in the Convention. The Convention also

Additionally, IAEA officials believe that the Agency's existing emergency response unit of three persons should be enhanced to provide a capability for performing radiological assessments during accidents and that more needs to be done in the collection and interpretation of radiological background levels so that accident releases can be quickly assessed. IAEA officials noted that the use of radiological terms during and after the Chernobyl accident had been extremely confusing and that some mechanism is needed to ensure that reports from national authorities are uniform.

## Reservations About Conventions

France and Italy have expressed concern that the Early Notification Convention does not provide sufficient obligation for prompt reporting of nuclear accidents. They question whether the reporting provisions would allow the same type of delay in notification as occurred during the Chernobyl accident. They believe the Convention would allow the country in which an accident occurs to decide whether a radioactive release was, in its opinion, of "radiological significance" before notifying its neighbors of an accident. This could be a problem in a nuclear accident because of different radiological standards and acceptance of risk among countries.

The State Department, in commenting on a draft of this report, pointed out that the United States and other member states agreed at the time of the drafting of the Convention that the term "radiological safety significance" should not be defined in relation to transboundary consequences that would trigger reporting under the Convention. They believe that having a definition could discourage "forthright and timely reporting." They do not believe it is practicable to expect international advance agreement on assumptions that would be necessary to have a "pre-defined standard, e.g., dispersion and transport models, radiological release constituents, and dose pathways." Further, they stated that "trying to apply a numerical threshold would require virtually instant calculations when information and data are poor or unavailable."

According to Nuclear Energy Agency officials, the European Community is currently working to conclude a regional agreement that would require stronger provisions for notification of nuclear accidents. This proposed agreement could require the notification of all accidents not covered in the Convention, whether or not they involve a transboundary release of radiation at military nuclear facilities. These officials, however, indicated that there are no plans to conclude a similar agreement with East bloc countries.

installations would be taken into account. The Department of Energy told us that there should be no implications that IAEA or member states would assume mandatory responsibility to provide cost-free aid.

At any time prior to the entry into force of the Convention in a signatory state, the state may declare that it does not consider itself bound in whole or part by the pertinent parts of either the privileges and immunities provisions or the claims and compensation provisions of the Convention. Four states (France, Ireland, Norway, and Turkey) have exercised the reservation concerning the privileges and immunities provisions. Four states (China, France, Ireland, and the Netherlands) have also stated that they will not consider the claims and compensation provisions binding. The United States has reserved for itself a reciprocal right to suspend operation of all privileges, immunities, claims, and compensation provisions in the event a dispute arises with another state that has reserved not to be bound by such provisions.

The Convention assigns an active role to the IAEA in facilitating cooperation among member states and international organizations, particularly through its expert services and manpower training and development.

## Actions Needed to Implement the Conventions

Although both conventions call for IAEA to have an important role in the event of a nuclear accident, as of April 1987 IAEA officials had no detailed information on how the conventions would be implemented or what funding resources would be available for these purposes. They believe that the Agency needs to develop its communications and data processing capabilities to handle information that would be received under the Early Notification Convention and to process requests for assistance. Further, IAEA needs to develop an emergency assistance manual listing experts, equipment, and materials along with information on techniques and methodologies that can be used in response to an accident. The State Department believes that development of the manual will be a limited activity because most of the information needed will be kept by national authorities.

This need was illustrated about 4 days after the Chernobyl accident, when Soviet citizens working at the IAEA unofficially approached U.S. citizens working there. The Soviets wanted to purchase large quantities of a special plastic film to spray on the ground at the accident site to hold the radiation in place to prevent contamination of nearby villages and waterways. The U.S. employees provided the name and address of a U.S. company, and the Soviets reportedly made their purchase.

needed to prevent future accidents and to mitigate potential consequences. INSAG recognized that it would take years to assess the radiation damage to people, animals, and food. Its September 1986 report included the following recommendations to the Director General of IAEA.

- Review existing international nuclear safety standards to ensure that they incorporate the important lessons learned from accidents, such as reactivity-initiated accidents, fire prevention, and fire fighting.
- Ask members to provide experts for OSART missions and enhance IAEA capability to provide OSART services to strengthen the cooperation of member states.
- Upgrade and expand IAEA's Incident Reporting System to broaden the information base and analyze this information more extensively so that lessons learned are available to member states.

#### International Standards Proposed

In November 1986, IAEA convened an Expert Working Group of more than 170 experts in nuclear safety and radiation protection from 48 countries. The objectives were to establish priorities among international nuclear safety measures endorsed at IAEA's General Conference and to examine whether it would be feasible to transform some nuclear safety standards into minimum binding rules.

The latter objective was prompted by proposals from Austria, Finland, and West Germany to establish mandatory nuclear safety standards verified by nuclear safety inspections. These member states believed that mandatory standards and inspections would (1) reduce the risks of a nuclear accident and help to ensure that all nuclear power plants were operated safely and (2) promote greater openness and availability of information on national safety requirements and how those requirements were implemented. Austria and West Germany suggested that mandatory standards could be modeled either after the IAEA's nuclear safeguards or the OSART program.

The Expert Working Group, while stressing that nuclear power plants have a good overall safety record under existing practices, recommended actions at the international level to strengthen cooperation and to place greater emphasis on accident prevention and operational safety. The Group's major conclusions and recommendations, listed below, were consistent with those of INSAG.

1. Establish international standards for nuclear plant control room operator training and put more emphasis on studying human factors.

Some states have expressed concern that the types of accidents requiring notification are too limited. For example, the Indian government has stated that the Convention's scope of application should be expanded significantly to require notification in the event of any nuclear accident with international consequences, regardless of the source of radioactive emissions.

Our review of the Convention shows that it contains broad language concerning the kinds of nuclear accidents to be reported and implies that the Convention's requirements are limited to nuclear accidents involving facilities or activities associated with power generation. This would include power reactor accidents on naval vessels and in space objects. Although the Convention applies to military facilities as well, it makes no reference to accidents connected with nuclear weapons and nuclear weapons tests. The nuclear weapons states (United States, United Kingdom, Soviet Union, France, and China) settled for broad language because they did not want to be in a position of being compelled to release militarily sensitive information on minor accidents involving nuclear weapons. The Convention does provide, however, that member states may volunteer notification of such accidents with a view to minimizing the radiological consequences. At the time of the signing of the Convention, the five nuclear weapons states issued Statements of Voluntary Application, broadening the scope of the Convention to include early notification of any accidents at military facilities. This action seems to confirm the ambiguity of the Convention as to the extent to which it applies to military weapons-related nuclear accidents.

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## Proposals for Extending IAEA Safety Activities

IAEA's Board of Governors decided in May 1986 to convene a meeting of leading international nuclear safety experts to discuss the Chernobyl accident. This meeting took place in August 1986, and the Soviet Union gave a detailed report on the accident. During the weeks after the meeting, the International Nuclear Safety Advisory Group (INSAG) and a team of IAEA experts prepared a report giving a clearer picture of the evolution of the accident and its consequences.

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## INSAG Recommendations

The major conclusions reached by INSAG were that the accident identified "no new physical phenomena" and that an international "safety culture" in nuclear power plant operation and greater cooperation were

accept inspections. (In reviewing a draft of this report, the Department of Energy emphasized that in agreeing to safeguards inspections the member states have not turned over fundamental national regulatory and operational responsibilities to the IAEA.)

To meet increased demand, IAEA increased funding for the OSART program by \$180,000 in 1987 for 9 missions and by \$365,000 in 1988 for 17 missions. Eventually, IAEA officials would like to conduct OSART reviews in each of the 26 countries that operate nuclear power reactors. This would include reviews in both the United States and the Soviet Union. According to IAEA officials, the guidelines for the missions will also be modified to reflect recent developments in emergency operations procedures, operating feedback, accident management, and emergency response capabilities.

Member states have also proposed several ways to strengthen the OSART mechanism. First, members might accept an obligation to receive an OSART visit whenever requested by IAEA, and IAEA would routinely request a certain number each year. Second, members would commit themselves to invite OSART visits with a certain frequency. Third, while OSART reports would always remain advisory and confidential unless members wish it otherwise, the IAEA Secretariat could be instructed to report to the Agency's Board of Governors any case where OSART advice had not been heeded.

IAEA officials admit there are limitations on the use of OSART reviews. First, the Agency will probably never have the resources to inspect every power reactor unit in the world. Second, OSART reviews are not intended to uncover all the safety problems but instead to provide a "glimpse or snapshot in time" as to what is happening at a nuclear power station. Finally, IAEA does not systematically follow up on OSART recommendations.

IAEA's ability to meet the increased demand for OSART reviews may be limited by its ability to recruit qualified safety inspectors. A former chairman of the U.S. Nuclear Regulatory Commission voiced concern that it would be difficult to recruit qualified inspectors because of (1) IAEA members' reluctance, including that of the United States, to increase funding for IAEA, (2) a shortage of qualified personnel, and (3) difficulties in attracting candidates to work in "the highly politicized environment in which the IAEA now operates." The current manager for the OSART program shares these concerns and speculates that one result could be that IAEA safeguards inspectors who monitor inventories of

2. Use IAEA's standards as a basis for common internationally accepted safety requirements; however, nuclear plant safety should remain principally a national responsibility and mandatory international safety rules are not necessary.
3. Strengthen guidance and procedures for fire protection and reactor testing.
4. Increase the number of OSART visits.
5. Improve IAEA's Incident Reporting System with greater coordination between the Agency's system and others like it.
6. Upgrade the quality of reports.
7. Establish an international working group to review advanced technologies and systems for water-cooled reactors from safety perspectives.

The General Conference of IAEA approved a supplemental funding increase of \$2.3 million for 1987 and an estimated \$4 million for 1988 to enhance the nuclear safety program. The General Conference had previously approved a regular 1987 budget for nuclear energy and safety activities of \$16.9 million. The supplemental funds are intended to expand existing voluntary services to member states, such as OSART missions, and to promote the exchange of safety information in the areas of accident prevention, emergency response, and human health. In commenting on a draft of this report, the State Department pointed out that expanded nuclear safety activities expected from the IAEA should be balanced against the stringent budgetary environment (zero growth budgets) in which the IAEA now functions.

## Expanding OSART

After the Chernobyl accident, IAEA officials and some members proposed doubling OSART reviews as the most valuable and significant means of making near-term contributions to safety. It was suggested that IAEA inspect one reactor unit in each of the 26 member countries (which have a total of 396 units) with nuclear power. Several countries indicated a willingness to invite an OSART review as a means of improving nuclear safety practices in their plants and assuring the public and other countries of the safety of their nuclear installations. This plan differs from the existing safeguards inspection program where member states agree to forego a limited measure of sovereignty in that IAEA decides when it wishes to inspect and the member state has legally committed itself to

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## Radiological Protection

IAEA is planning several projects with other international organizations to assess the health consequences of the Chernobyl accident and to establish more uniform standards for radiological protection of public health. In a joint effort with WHO, IAEA is planning to collect environmental measurements from countries affected by the release of radioactive materials during the accident. It is also exploring the possibility of developing a long-term program with WHO, the World Meteorological Organization, and the U.N. Scientific Committee on the Effects of Atomic Radiation to improve post-accident prediction of environmental consequences, environmental monitoring capabilities, and planning for public health countermeasures.

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## Conclusions

IAEA member states have recently agreed that international cooperation in nuclear safety must be strengthened to prevent future accidents, mitigate consequences, and strengthen public confidence in nuclear technology. This general consensus produced two international conventions to provide (1) prompt notification of nuclear accidents and (2) procedures to facilitate mutual assistance during an emergency. However, some states believe further efforts may be needed to strengthen the obligation for early notification that would lead to triggering reporting under the Early Notification Convention.

In addition to facilitating the drafting of two international conventions based on its earlier published guidelines, IAEA has also expanded OSART missions, enhanced information exchange on operational safety events at nuclear power plants, and planned a review of its nuclear safety standards to ensure that they include the lessons learned from the accident.

nuclear material in civilian facilities may be diverted to perform safety inspections, thereby diminishing IAEA's nuclear non-proliferation efforts.

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**Assessment of Safety  
Significant Events Teams**

Starting in late 1986, IAEA offered a new program, called Assessment of Safety Significant Events Teams, to provide an engineering assessment of nuclear power reactor safety-related incidents and offer recommendations to plant operators on preventive measures. According to IAEA, one area the assessments focus on is human factors, which were a direct cause of both the Three Mile Island and Chernobyl accidents. A team visit to Yugoslavia was made in 1986 and four assessment missions to other countries are planned annually.

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**Nuclear Safety Standards**

The Chernobyl accident prompted a re-evaluation by member states of accident sequences in nuclear power plants and of the safety procedures and design features necessary to cope with them. Also, IAEA plans to re-examine its safety standards with the view toward incorporating lessons learned from the accident. After the Three Mile Island accident, the NUSS program was reassessed and the basic approach was found sound, given the information and level of technology at that time. It was also recognized, however, that in areas such as probabilistic risk assessment, human factors, methodology, and best estimate consideration of detailed accident sequences, more advanced technology was emerging. According to IAEA's Expert Working Group, two areas where nuclear safety standards may be strengthened include prevention of power surges and fire prevention and fire fighting.

Reports that operator errors and violations of safety procedures led to the Chernobyl accident have prompted interest in improving operator training and qualification standards. IAEA may also revise its guidebooks and quality assurance procedures on operator training and qualifications, and it plans to study the feasibility of establishing voluntary international standards for operator training programs.

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**Incident Reporting System**

IAEA plans to expand its Incident Reporting System to include a broader range of operational events, in-depth analysis of selected events, and a data base for the main safety features of operating nuclear power plants. A prompt notification procedure is also planned to allow for earlier examination and interpretation of incidents.

The commitment of some countries to nuclear power is based on the economic reality of having invested billions of dollars in nuclear facilities because they have no viable alternative to attain indigenous energy supplies. About 15 percent of the electricity in the world is now nuclear-generated, and by 1990 it is expected to grow to 20 percent. Following the Chernobyl accident, the Soviet Union announced that it would not be deterred from its plan to increase the share of electricity it generates by nuclear energy. The United States has about 100 plants in operation and is committed to nuclear power as an essential source of non-petroleum-based energy.

Although no new nuclear power plants have been ordered in the United States since 1978, the Secretary of Energy made the following statement to the IAEA plenary session in September 1986.

“U.S. energy requirements for electricity make it imperative that nuclear power remain an attractive and available option in our energy mix for the world. If growth in the U.S. is any example, and the growth of our electricity demand runs only two to three percent annually, we will still require some 100 to 300 gigawatts<sup>1</sup> of new electricity generating capacity by the year 2000—less than 15 years away. That is equivalent to 100 to 300 new nuclear power plants. While much of this capacity will be coal-fired and some will burn natural gas, we believe a significant fraction should also be nuclear.”

## Maintenance of Safety Is an International Concern

President Reagan and other leaders of industrial nations stated in May 1986 that each country engaged in nuclear power generation bears the full responsibility for the safety of its installations. At the same time, they noted that, for each country the maintenance of safety is an international responsibility. However, despite statements of concern by some European nations over the need for mandatory international safety and reporting standards, the United States and some other members of the IAEA do not support a mandatory standards and verification regime. According to the U.S. ambassador to the IAEA, the establishment and maintenance of safety standards and conduct of inspections to ensure compliance with those standards are “jealously guarded national prerogatives” in most countries, who would be reluctant to turn over all, or even a part, of that responsibility to any international body. In addition to questions of political sovereignty, he believes any attempt to conduct mandatory plant safety inspections would impose a severe burden on the IAEA’s budget and personnel.

<sup>1</sup>A gigawatt is one billion watts of electricity.

# International Standards and Inspections

The Chernobyl accident has reinforced the fact that nuclear safety is an international as well as a national concern. Some IAEA members have asserted that to dispel any question about nuclear power plant safety, it is necessary to establish international safety standards that are subject to verification by inspection, with the results made available to the public. However, there is currently no consensus among IAEA members to mandate safety standards and an inspection regime for the 26 countries which are now operating 396 nuclear power plants. (See table III.1.)

**Table III.1: World Status of Nuclear Power Plants<sup>a</sup>**

Country	Reactors (total net MWe) <sup>b</sup>	Country	Reactors (total net MWe)
Argentina	2 (935)	Japan	34 (24754)
Belgium	8 (5486)	Korea, Rep. of	6 (4475)
Brazil	1 (626)	Netherlands	2 (508)
Bulgaria	4 (1632)	Pakistan	1 (125)
Canada	18 (11107)	South Africa	2 (1840)
Czechoslovakia	7 (2799)	Spain	8 (5588)
Finland	4 (2310)	Sweden	12 (9455)
France	49 (44693)	Switzerland	5 (2932)
German Democratic Rep.	5 (1694)	Taiwan, China	6 (4918)
Germany, Fed. Rep. of	21 (18946)	United Kingdom	38 (10162)
Hungary	3 (1235)	United States	100 (83387)
India	6 (1164)	Soviet Union	50 (27657)
Italy	3 (1273)	Yugoslavia	1 (632)

<sup>a</sup>As of February 1987.

<sup>b</sup>Megawatts-electric.

Source: IAEA

## Continuing Commitment to Nuclear Power

Overall, the international commitment to operating nuclear power plants has not diminished. Except for Austria, which has abandoned its sole nuclear power plant, and Sweden, which plans to phase out nuclear power plants by the year 2010 at the latest, countries with nuclear power programs are continuing their support for nuclear power to help supply their energy needs. Some countries outside the United States have delayed the opening of nuclear plants because of the growing anti-nuclear power protests, but they have not cancelled them. In the United States, however, a number of plants have been cancelled for economic reasons in the last several years.

identifying and assessing deficiencies in plant operation and in developing procedures to remedy those deficiencies. This would help to

- improve system reliability and increase the time that power plants are on line,
- improve system designs, surveillance, and test schedules, and
- identify failure trends and wear-out patterns.

A former Chairman of the Nuclear Regulatory Commission informed us that to accomplish these benefits would require (1) extensive and enforced data collection and (2) skilled analyses of the data. According to the former Chairman, the Commission has found these to be formidable tasks for U.S. plants.

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## Verification Issues and Problems

The principle of independent verification means that nuclear safety information and data provided by members must be subject to confirmation. Such a regime could increase members' overall confidence that nuclear power plants are being safely operated using internationally recognized standards. Proponents of such a change believe it has precedent in the IAEA. For example, the IAEA safeguards program, which requires that member states accept safeguards inspections to verify that nuclear materials, equipment, and facilities intended for peaceful use have not been diverted to military purposes, could be equally applicable to a nuclear safety verification program at commercial power plants. However, any IAEA-sponsored regime for the independent verification of the safety of nuclear plants worldwide would face technical, financial, and institutional problems.

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## Technical Difficulties

The regulation of nuclear reactors is a difficult technical undertaking, which U.S. officials believe raises fundamental issues of public policy (the trade-offs between cost and public risk). Many different nuclear reactor technologies are currently in use. The United States uses two types—the pressurized water reactor and the boiling water reactor. Other countries use different designs of heavy water moderated/cooled reactors, and various types of gas-cooled reactors; the Soviet's RBMK reactors are unique to a single country. An inspection program would therefore have to maintain expertise in each technology.

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## Financing Issues

An independent nuclear safety verification program would present a major challenge to the IAEA's ability to mobilize manpower and other

The State Department estimated that the cost of an international inspection system would be high. There were 396 power reactors in operation worldwide as of February 1987 and over 150 under construction. IAEA reported that the IAEA applied safeguards<sup>2</sup> to 485 nuclear facilities and 414 other locations in 1986, with annual expenditures of \$38 million. State Department officials point out that there is an additional approximately \$15 million in voluntary safeguards support for research, development, and inspector training. The State Department believes that the cost of safety inspections would be even greater than safeguards inspections because of the need to establish a new inspections group within the IAEA, which would have to develop equipment and maintain expertise for the wide variety of nuclear reactors currently in operation or under construction.

## IAEA Standards Are Optional

Most members of the IAEA, including the United States, view IAEA's NUSS as guidelines that are not binding on any country. The United States, in fact, has resisted having the standards prescribed in an international agreement to avoid "the tendency towards settling upon the lowest common denominator." The United States prefers instead to encourage voluntary association with good practice and internationally agreed guidelines while retaining flexibility to promote established U.S. practices. The NUSS were designed to help developing countries start nuclear power programs. They have been increasingly used as a reference for codifying regulatory requirements, particularly in the quality assurance and siting areas. France, Italy, the Netherlands, and Spain have to varying degrees based their quality assurance practices on these documents. Also, a number of North African and Middle Eastern countries use the siting documents to perform systematic site surveys.

According to IAEA, there is consensus among IAEA members that countries are responsible for their own nuclear safety programs and for regulating their own nuclear reactors. Nevertheless, an IAEA official believes that the mandatory use of standards that can be verified through an inspection regime would enable IAEA to develop more comprehensive data on safety-related system and component failures than is presently attainable under its voluntary incident reporting system. For example, proponents of the mandatory system believe that it could produce statistics from nuclear power plants worldwide to assist member states in

<sup>2</sup>The IAEA safeguards program establishes a system of inspection and verification which, when applied to one country's nuclear activities, will provide assurance to other countries that nuclear material is not being diverted for non-peaceful purposes. IAEA's safeguards efforts are of major interest to the United States.

developing countries, seems to have changed as it became evident that there were transboundary consequences of a nuclear accident.

Many developing countries treat the safeguards program as one of interest only to the industrialized nations with nuclear power programs and not applicable to them. They support the program in exchange for technical assistance, which can be their main reason for being IAEA members. Developing countries might not support an IAEA verification regime if it was perceived as competing with technical assistance benefits. On the other hand, developed nuclear weapons states could perceive an IAEA verification program as taking limited resources away from the safeguards program.

## Conclusions

There is disagreement on whether preventive measures, such as mandatory safety standards and a verification program, should be adopted. There appears to be a nearly unanimous belief among IAEA members that any attempt to impose international safety standards verified by an international inspection program would infringe on national sovereignty. This is the U.S. position, and U.S. officials point out that establishing mandatory safety standards and inspection for the many different types of reactors would be expensive and impractical and may be of questionable benefit. Although several Western European countries have proposed establishing some binding safety standards and inspections, no specific plans have been made, and at this time, IAEA's member states are unlikely to adopt mandatory safety standards and an inspection program.

resources required for the task. IAEA officials believe that technical and support personnel could be recruited to meet any desired staffing level but that it would be a costly undertaking. The program would require not only inspectors but also a broad range of auxiliary and support functions, all duplicating those of national inspection systems. IAEA officials have not estimated the cost of a verification program but believe that it would represent a small fraction of the cost of building and operating the 396 power reactors in use and might lead to the safer operation of those power facilities.

If a verification program were adopted, it could be financed in a way similar to IAEA's safeguards program, which uses a special formula to insulate developing countries from most safeguard costs. These costs are accepted by the industrialized countries, which are the principal users of nuclear power.

## Institutional Problems

A verification program must not only identify safety problems but also create confidence that nuclear power plants are safe. In any such program, the question of how much information should be released on the safety of nuclear plants is important. If such a program were under IAEA aegis, its current statute requires that the Director General and the IAEA staff "not disclose any industrial secret or other confidential information coming to their knowledge." The provision is intended to protect information belonging to member states. This provision, according to an IAEA official, establishes no requirement or authorization for IAEA to withhold information concerning the nature and extent of its own inspection activities. But, according to a former Chairman of the Nuclear Regulatory Commission, the safeguards inspection reports are kept secret, even from other member states.

Similarly, complete disclosure of inspection activities might not be in the interest of an effective verification program. To keep the flexibility to do what is necessary to preserve safety in specific cases, some confidentiality might be needed. Increasing the dissemination of inspection information could lead to a confrontational relationship between members and the IAEA and to less, rather than more, access for IAEA safety inspectors.

Another institutional problem is that IAEA has other activities, such as the safeguards program, for which major resources are applied. Before the Chernobyl accident, many countries without nuclear power did not believe nuclear safety was a priority. The attitude, especially among

# Comments From the Department of State



United States Department of State

Comptroller

Washington, D.C. 20520

February 2, 1988

Dear Mr. Conahan:

I am replying to your letter of December 2, 1987 to the Secretary which forwarded copies of the draft report entitled "Nuclear Power Safety: International Measures in Response to Chernobyl Accident" (GAO Code 488133) for review and comment.

The enclosed comments on this report were prepared in the Bureau of Oceans and International Environmental and Scientific Affairs.

We appreciate the opportunity to review and comment on the draft report.

Sincerely,

A handwritten signature in cursive script that reads "Roger B. Feldman".

Roger B. Feldman

Enclosure:  
As stated.

Mr. Frank C. Conahan,  
Assistant Comptroller General,  
National Security and  
International Affairs Division,  
U.S. General Accounting Office,  
Washington, D.C. 20548.

# The 113 Member States of the IAEA

Afghanistan	Gabon	Madagascar	Thailand
Albania	German Democratic Republic	Malaysia	Tunisia
Algeria	Germany, Federal Republic of	Mali	Turkey
Argentina	Ghana	Mauritius	
Australia	Greece	Mexico	Uganda
Austria	Guatemala	Monaco	Ukrainian Soviet Socialist Republic
		Mongolia	Union of Soviet Socialist Republics
Bangladesh		Morocco	United Arab Emirates
Belgium	Haiti		United Kingdom of Great Britain and Northern Ireland
Bolivia	Holy See	Namibia	United Republic of Tanzania
Brazil	Hungary	Netherlands	United States of America
Bulgaria		New Zealand	Uruguay
Burma		Nicaragua	
Byelorussian Soviet Socialist Republic	Iceland	Niger	
	India	Nigeria	
	Indonesia	Norway	
Cameroon	Iran, Islamic Republic of		
Canada	Iraq	Pakistan	
Chile	Ireland	Panama	
China	Israel	Paraguay	
Colombia	Italy	Peru	
Costa Rica		Philippines	
Cote d'Ivoire		Poland	
Cuba		Portugal	Venezuela
Cyprus	Jamaica		Vietnam
Czechoslovakia	Japan	Qatar	Yugoslavia
	Jordan		
		Romania	
Democratic Kampuchea	Kenya		Zaire
Democratic People's Republic of Korea	Korea, Republic of	Saudi Arabia	Zambia
Denmark	Kuwait	Senegal	Zimbabwe
Dominican Republic		Sierra Leone	
		Singapore	
Ecuador	Lebanon	South Africa	
Egypt	Liberia	Spain	
El Salvador	Libyan Arab Jamahiriya	Sri Lanka	
Ethiopia	Liechtenstein	Sudan	
	Luxembourg	Sweden	
		Switzerland	
Finland		Syrian Arab Republic	
France			

- 2 -

located. This convention is applicable to military facilities. (Note: page 28 is in error in stating that the Early Notification Convention's requirements are limited to civil nuclear accidents -- see third line from bottom.)

With respect to mandatory standards for protective action and related steps by regulatory authorities, the U.S. has resisted having them prescribed in an international agreement to avoid the tendency towards settling upon the "lowest common denominator." The U.S. prefers instead to encourage voluntary association with good practice and internationally agreed guidelines, while retaining flexibility to promote adequate standards, including those according with established U.S. regulatory practice.

We suggest that the report quote the U.S. statement of policy given at the signing of the two Conventions in 1986 and the fact that we are awaiting Senate advice and consent to ratify the conventions.

B) DOE Comments

Page 2 - Third line from the bottom. Most members saw a need for having a way to focus voluntary commitments to provide notification and assistance. As written, the text suggests a need for binding "guidelines" that we believe is overstated.

Page 3 - End of first full paragraph. We expect the IAEA's "emergency assistance manual" activities to be minimal, since this information is largely held by national authorities.

- Second full paragraph. This could be a place to note the status of U.S. ratification action, e.g., by footnote.

- Penultimate line. Rather than "vague," the Early Notification is "broad" concerning the types of accidents to be reported.

Page 4 - First full paragraph, middle..."Currently, IAEA has no regulatory role...". As indicated in general comments, this is proper. By reason of the IAEA's statutory mission, let alone financial considerations, its role is one of giving sound technical advice and facilitating cooperation.

GAO DRAFT REPORT: NUCLEAR POWER SAFETY - INTERNATIONAL  
MEASURES IN RESPONSE TO CHERNOBYL ACCIDENT

Background

The Department of State has carefully reviewed the subject GAO report. During and after the Chernobyl accident the Department worked closely with the Department of Energy, Department of Defense and the Nuclear Regulatory Commission as well as other agencies in dealing with the Chernobyl situation. Because of this close cooperation between the concerned agencies, the Department has felt it appropriate to consult with these other agencies in reviewing the subject GAO report.

A) General Comments

Certain points should be made clear early in the report. In particular the draft report should provide sharper focus on the fundamental responsibility of national authorities in nuclear safety and radiation protection. The IAEA is not designed to function as an operating extension of national regulatory authorities, although it clearly is a facilitator of technical information flow and advice related to radiological safety and protection.

There should be balance when addressing services expected from the IAEA in areas where it has established expertise and mission against the implied monetary resources required. The report should give perspective on the stringent budgetary environment in which the IAEA now functions.

The report does not make clear the negotiating history of the Early Notification Convention. Notwithstanding proposals from several quarters, it was agreed that there should be no definition of the term "radiological safety significance," in relation to transboundary consequences, that triggers reporting under the Early Notification Convention (article I). In fact, having a definition would likely be counter-productive to the desire to encourage forthright and timely reporting. Unlike experience under planned operations, there is no realistic way to define in advance all the variables that might have to be addressed in making the rapid calculations necessary for giving notice applicable under a pre-defined standard. It is not practicable to expect international advance agreement on assumptions that would be necessary to arrive at a pre-defined standard, e.g., dispersion and transport models, radiological release constituents, and dose pathways. Trying to apply a numerical threshold would require virtually instant calculations when information and data are poor or unavailable.

The GAO report drafters have not made it clear that the Early Notification Convention applies to reactors wherever

- 4 -

Now on page 20.

Page 29 - See earlier comments on reporting pertaining to weapons, all of which is taken seriously.

Now on page 25.

Page 37 - end of first paragraph under "conclusions." Note earlier statement about U.S. views on early notification.

Now on page 29.

Page 43 - The draft report notes serious questions involved in considering the verification proposals. See earlier comments re page 6.

C) OASD/ISP Comments

Now on page 2.

On p. 3, line 8, "emergency response unit" is more accurately regarded as a "capability."

Now on page 2.

On p. 4, line 1, the disclosure of sensitive or proprietary information was not only a concern of the NWS.

Now on page 9.

On p. 10, para 1, line 7, the statement that only NWS were concerned about diverting resources from safeguards is not true.

Now on page 17.

On p. 24, the reference to bilateral and multilateral arrangements is somewhat inaccurate. The operative language in the convention merely notes that when it has been in their mutual interests, states have concluded bilateral or multilateral arrangements relating to the subject matter of the convention, and that nothing in the convention would prevent them from doing so in the future.

Now on page 18.

On p. 26, line 5, the IAEA does not have a "major role" in the event of an accident in terms of the conventions. It has an important role, one that is very carefully defined.

Now on page 20.

On p. 28, third para., line 4, the reference to divisions among the NWS on the release of military information incorrectly implies that France had a different view, and that only NWS had concerns about the release of information. Also, it ignores the very important point that there was agreement on which kinds of information should be released.

Now on page 9.

D) NRC Staff Comments

1. Page 9, paragraph 1, sentence 2 under "The Role of IAEA After Chernobyl"

Insert the word "worldwide" between "with" and "nuclear" so the sentence will read: "The accident also underscored the role of the IAEA as the foremost international organization concerned with worldwide nuclear safety."

- 3 -

Now on page 3.

Page 6 - Regarding mandatory standards, see earlier comments. Further, with respect to verification by inspection, the early part of report does not provide adequate perspective on the very different purpose served by IAEA safeguards when addressed in the context of safety. Inspections are not a police function under the international safeguards regime of the IAEA; rather, the Agency verifies that nuclear materials and facilities dedicated to peaceful uses are in fact employed for such ends. States have in fact agreed to forego a limited measure of sovereignty in this regard, but in so doing they have not turned over fundamental national regulatory and operational responsibilities to the IAEA.

Now on page 13.

Page 17 - Table I.1 should be updated through 9/87 to show 1987 OSART's in Mexico and U.S.

Now on page 16.

Page 22 - Third line from bottom. The wording about "sources" seems too broad; it could be read to include material from a nuclear weapon, which would not be covered by the Early Notification Convention.

Now on page 18.

Page 25 - Middle paragraph. It would be useful perspective to note that, under the Emergency Assistance Convention, one of the matters to be addressed is responsibility for costs. There should be no implications that the IAEA or other Member States have assumed mandatory responsibility to provide cost-free aid.

Now on page 18.

Page 26 - As a point of perspective, the IAEA Secretariat has by now received considerable programmatic and budgetary guidance on the useful steps it should undertake to implement its responsibilities under the Conventions.

Now on page 19.

Page 27 - Last paragraph. The noted French and Italian view should be counterbalanced by the U.S. view (note above).

Now on page 20.

Page 28 - The Notification Convention is "broad" rather than "vague" in our view. Moreover, its application is not limited to civil nuclear accidents. A "nuclear reactor wherever located" (Article I, Section 2(a)) applies to Navy vessels.

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Now on page 12.

2. Page 15, paragraph 2. sentence 4

The U.S. (and some other countries) expressed reservations about the need for another reporting system unless the new system would include incident data from IAEA member states (including the USSR and the Eastern bloc not already participating in the NEA's IRS. The U.S. limited its endorsement of (and participation in) the IAEA's system until it had some assurance that the new system would not merely duplicate the NEA's but would significantly enhance it.

Now on page 13.

3. Page 17

The list of OSART Missions for 1987 (through the indicated cutoff date of April 3) does not include Mexico, the Laguna Verde plant, January 12-30 1987.

Now on page 16.

4. Page 22

The first full sentence should read: "As of April 1987, no such agreements had been negotiated by or through the IAEA." (NRC has had general language providing for limited assistance in the case of a nuclear accident in two of its regulatory agreements for the last 3-5 year).

Now on page 30.

5. Page 46, paragraph 3, sentence 2

The word "many" should be added before "countries" to read: "Before the Chernobyl accident, many countries without nuclear power did not believe nuclear safety was a priority." This was not true of all non-power reactor countries.



Richard J. Smith  
Acting Assistant Secretary  
Bureau of Oceans and International  
Environmental and Scientific Affairs

**National Security and  
International Affairs Division**

B-230418

April 8, 1988

The Honorable John Glenn, Chairman  
Committee on Governmental Affairs  
United States Senate

The Honorable Thad Cochran  
United States Senate

This report responds to Senator Cochran's request of May 19, 1986, in his capacity as Chairman of the former Subcommittee on Energy, Nuclear Proliferation, and Government Processes, Senate Committee on Governmental Affairs, that we examine the potential for an expanded nuclear safety role in the International Atomic Energy Agency (IAEA). Specifically, we were asked about IAEA undertaking greater responsibilities for inspecting nuclear power reactors and setting up an international mechanism for rapid response to mitigate the consequence of a nuclear accident. The results of our work are summarized below and discussed in detail in appendices I through III.

The massive Chernobyl accident, with its clear message that a nuclear accident can have international consequences, prompted an immediate call by world leaders for greater international cooperation in nuclear safety, including timely notification and dissemination of accident information and a system of emergency response and coordination within the framework of the IAEA. Worldwide attention has also focused on an evaluation of the causes, circumstances, and consequences of the accident so that "lessons learned" can be applied to increasing the operational safety of nuclear power plants, especially since by the year 2000, IAEA estimates that slightly more than half of the countries with nuclear power reactors will be developing countries. With the expected growth in countries with little nuclear operating experience and limited resources to handle a severe accident, nuclear safety will continue to be a concern.

**International  
Cooperation  
Agreements**

Following the accident, the member states of the IAEA enacted two international conventions, or agreements, to enhance cooperation in providing information and emergency assistance following a nuclear accident: (1) the Convention on Early Notification of a Nuclear Accident and (2) the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. As of February 5, 1988, both agreements were being considered for ratification by the U.S. Senate. IAEA had published

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General Accounting Office  
Washington, D.C. 20548

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